Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

RECEIVED
★ FEB 13 1941 ★
U.S. Department of Agriculture

ACE-80

QUESTIONS ABOUT SOUTHERN FARM BUILDINGS

Prepared by W. V. Hukill, Senior Agricultural Engineer,
Bureau of Agricultural Chemistry & Engineering, for
presentation at the meeting of the Southern Section of
The American Society of Agricultural Engineers,
Atlanta, Georgia, Feb. 6, 1941

What are the subjects on which research can be most effectively applied to improve farm buildings in the South? We all know there can be no general answer to that question. It has to be answered with regard to the particular facilities and talents available, and the degree to which the results can be expected to meet the problem studied. It is, however, a legitimate question and partial answers may be found in a number of ways.

The questions that farmers ask about building problems met on the farm have an important part in deciding what research would be fruitful. The Bureau of Agricultural Chemistry and Engineering receives and answers, as best it can, a considerable number of inquiries direct from farmers all over the country. These reflect individual problems encountered in construction or operation of buildings and the difficulties of actually attaining the structures needed. By selecting those from the Southern States it is possible to get information on the relative importance of various questions from the point of view of Southern farmers. Many of these inquiries may be answered with bulletins or other printed material and, it is gratifying to learn, a large number are now taken care of by reference to plans in the Southern Plan Service.

We have not attempted to make a detailed analysis of these letters but, aside from requests for plans themselves, there are a few general subjects which reappear constantly. These include prevention or removal of dampness, use of building materials, sanitation, and the general requirements that must be met, such as, for example, in storage houses or in livestock buildings. While these subjects are more or less interrelated each includes a number of distinct items which should be included in any list of needed research. The larger problem of actually getting improvements on farms where they are needed is implied in all the inquiries and needs special attention.

Much work has been done and is being done on environmental requirements. In the storage of farm products, the optimum conditions of temperature, humidity, and air motion have been determined tentatively for many products, although work is still needed on curing treatments and other modifications in storage practice, such as CO_2 or other gas storage. The increasing use of freezing preservation and locker storage has necessitated much study of the temperature requirements of various products during freezing and storage. The work most needed now is reduction of knowledge concerning these requirements to practical use by making suitable equipment available to farmers, and

providing them with the technical, economic and practical information that will permit adoption of freezing storage on a much larger scale.

The environmental requirements for farm animals have been established only in a general way. The same is true regarding comfort conditions for farmhouses. A great deal more work needs to be done before questions about practical limits of temperature, humidity, and ventilation tolerances can be answered with complete satisfaction. Research along the lines of determining environmental requirements, and finding how to meet them with economical structures and equipment, needs to be undertaken with the aid of the biological sciences. Studies should include effects of air stratification, drafts, and radiant heat exchange with hot or cold walls.

Control of atmospheric humidity or dampness in structures is one of the general problems on which technical research is most needed. One difficulty in working out methods of humidity control is the lack of suitable instruments for measuring moisture content of various materials and vapor pressure or relative humidity of air. An instrument which could be used to measure vapor pressure in remote locations or in small enclosed spaces, with the same facility as, say a thermocouple for measuring temperatures, would be an invaluable aid in opening the way for studies of moisture transfer and moisture control.

A large number of inquiries about preventing mildew and stale odors in houses or basements come from the Southern States. In most cases some special conditions are associated with the difficulties. Certain places are apparently affected more than others and frequently the trouble occurs only at certain seasons of the year. There are precautions that can be recommended to reduce the likelihood of nuisance from dampness, but there is need for further study of its control.

A recent inquiry about moisture control in the storage of sugar in a large warehouse furnishes an example of the difficulties in determining the source of dampness and eliminating its effects. This is not a farm example, but it illustrates the problem of moisture control as it frequently occurs. The warehouse, which stores about 500,000 bags of sugar annually, was built on piers, partly over water and partly over land. During certain seasons, the bags of sugar on part of the first floor became moist on the outside and the sugar was damaged. The inquirer wanted to know whether a one-inch coating of asphalt on the floor, in addition to wooden mats, could be expected to remedy the trouble. Certain suggestions were made, which partially solved the difficulties, and the manager was further advised to make observations of temperatures and humidities at critical points so that additional remedies could be applied. This case was typical in that only certain parts of the building seemed to give trouble and other parts apparently equally exposed, were free from trouble.

In the storage of grain, the same situation is frequently observed--that is, certain parts of a bin will be found to be in good condition while in other places the grain is out of condition on account of high moisture content, even though the entire lot may have been uniform at the time it was stored. If the transfer of moisture were better understood, possibly it could be made to operate to advantage

rather than to result in harmful accumulation.

The accumulation of moisture in insulated walls has been studied rather extensively and means for preventing it have been fairly well worked out. However, moisture transfer which accompanies small temperature gradients within hygroscopic materials and the absorption of vapor from the atmosphere offers a difficult research problem, but one which promises extremely useful results.

Another class of questions is about the use of native materials, such as logs and stone. Their possibilities have not been fully exploited, partly because of lack of equipment for handling and working the heavy units, and partly because the advantages of these materials have been lost sight of. Buildings in which these materials are used would be more common if the research agencies would develop methods and simple equipment to take advantage of their low cash cost. There are numerous relatively new commercial materials available for building. Studies of ways of combining commercial and native materials for the most economical buildings would provide more satisfactory answers to farmers' requests for advice on their building problems. Means should be worked out for cooperative operation, or community ownership, of equipment, such as concrete mixers, saws, paint sprayers, etc., which might be too expensive in first cost to warrant its purchase for individual jobs.

Among the materials being tested in the Bureau's cooperative project on farmhouses with the University of Georgia are cottonseed hulls for insulation and concrete slab floors to eliminate pier construction. The hulls may be treated to make them fireproof. The cost for fireproofing materials is relatively low, and while considerable labor may be required in preparing them, this is not always a serious handicap, since on many farms spare time may be used. There are some problems involved in the use of concrete slab floors, as Mr. Simons points out in another paper on this program. These and many other materials not commonly used in southern farm buildings need only to be developed by research and experimental application to become important factors in reducing the cost or improving the condition of farmhouses and other buildings. Questions about the use of earth as a building material and about addition of asphalt and cement as stabilizers for adobe and other forms of earth construction are common. What we need, in order to answer them more satisfactorily, is research as to the practicability of different methods and the durability of earth buildings in various climates. An interesting series of tests on some of the characteristics of earth walls is under way at the National Bureau of Standards.

We receive a great many inquiries about water supply and sewage disposal. One common question is "What chemical can I put in my septic tank to dissolve the solid material that accumulates and has to be cleaned out"? Such questions reveal a faith in science that is embarrassing when we consider that various authorities cannot agree on types and details of sanitary equipment that should be used in given conditions. Lack of complete agreement is to be expected, but it should stimulate efforts to determine the practicability of various types of equipment. Probably the research most needed in farm sanitation is that which might show more clearly the most important things to be done in providing sanitary facilities at low cost.

The technical problems that have been mentioned are representative of those suggested by frequent inquiries. All are being studied more or less, and progress can be expected to continue.

All research on farm building is intended to promote the well-being of farm people and increase the effectiveness of their efforts at production. It is not serving its purpose unless it contributes to these objectives. The finest technical results are largely lost if they are not translated to practical use on farms, either directly or indirectly Everyone recognizes this, but in practice it is frequently overlooked. The present condition of farm buildings throughout the country testifies that the results of research on its present scale are either not capable of meeting the farmers problems, or they have not been put in usable form. This suggests that in addition to the innumerable technical subjects of building research, there is a broad problem of actually getting good buildings built on farms. This is a problem which needs attention entirely apart from, or in addition to, study of the technical details that are a part of it. In his Annual Report for 1934 Secretary Wallace said: "Heretofore farm savings have larvely gone back into the farm to increase production. It would be sound economy to put an increased proportion into the home. Such a course, besides raising the farm standard of living, would harmonize with the need for controlling production."

It may be of interest to point out here the scale on which extension and research are being applied to farm building improvement. The best estimates we have indicate that for the country as a whole expenditures required to rehabilitate farmhouses and other buildings would be at least a billion dollars annually for the next ten years. Experience in almost every other field of construction has shown it to be economical to provide adequate engineering service for plans, testing of materials, new construction methods and the like, but such activity is almost entirely lacking in connection with farm construction. Less than one-fourth of the states have the equivalent of one full-time farm-building extension worker. Probably the annual expenditure for agricultural engineering extension work on farm buildings does not exceed $50,000. For research in farm buildings, aside from commercially sponsored projects, the figure is probably less than $150,000. This is a total of not over $200,000 for these activities. It is hardly to be expected that this sum will provide all the necessary background for this potential $1,000,000,000-a-year construction job.

What our present research and extension investment really amounts to is about 20 cents a year for each $1,000 of this needed construction. Getting this down to the farm, it amounts to the price of one three-cent postage stamp per farm.

For the lack of adequate construction and repair of farm buildings, the excuse may be given that low farm income is what stands in the way, or possibly the lack of extension facilities, or the failure of research workers to provide good building types at low cost. Whatever the causes, the remedy is not likely to appear spontaneously while the efforts of all those who see the situation are confined to independent research, or extension work, or economic studies. It will take the unified efforts of all groups to get the needed buildings actually put up.

What can be done to reverse the trend toward poorer and poorer farm buildings? It is evident that the present small expenditures for technical research and extension are not succeeding. The problem of making them adequately effective is still facing us. As in attacking many difficult problems, one of the hardest jobs is finding a place to start. However, starts have been made in a number of places. There are, for example, the small-scale projects in Arkansas, Alabama, and Wisconsin. In each case attempts are made to combine research, education and use of home resources to provide improved building with a minimum of cash outlay. The results of these small-scale projects indicate that a program might be devised whereby the general condition of farmhouses and other buildings could be improved tremendously within the next few years. Such a program would call for the combined application of extension and research methods and would utilize the energy and resources of farm people.

Secretary Wickard, in a recent address said: "We need adjustment that will mean better living; the ability to purchase with cash what must be purchased, and the ability to get from the land the things which make for better living." In another address he called attention to the increasing farm population and to the decreasing volume of exports of farm products. This leaves a still larger supply of labor on farms available for other activities than agricultural production. How can this resource of time and energy be utilized to increase the income, either in cash or in living, of farm people? One way would be to translate it into buildings which are so sadly needed. On the one hand we have a surplus of labor not gainfully employed; on the other hand we have, in the same section of the population, even on the same farm, a deficiency in essential structures. With an appropriate plan of action, the one situation could be used to relieve the other. Such a plan would contribute toward the broader and more general end of adjusting the farmer to the land. It would, in addition to providing greatly improved buildings, stimulate those industries which would have to supply the necessary commercial materials such as millwork, finish lumber, concrete, and hardware.

A plan for unified effort along this line has been proposed by Ashby and Hallauer in their paper, "A Program for Rehabilitating Farm Buildings," which was presented at the June meeting of the A.S.A.E. Attention is called to this paper because it constitutes a concrete proposal for an approach to this difficult problem. The plan proposed is to furnish farmers advice, instruction and a limited amount of direct assistance in planning their remodeling and new building, and in utilizing their own labor and such materials as are available on the farm for supplementing their cash resources. Competent building specialists would be assigned to areas of 1, 2 or perhaps more counties to study the building problems, find what is being done and what needs to be done, and help farmers work out ways of making these necessary improvements. These specialists would assist farmers directly in the following ways:

They would furnish approved plans for new buildings and plans for remodeling to meet needs of particular farms.

They would advise in selective cutting in farm woods and on the sawing, seasoning, and processing of lumber; advise regarding use of stone, gravel, earth or other materials available in the locality, and on salvaging and use of materials from old buildings, as well as regarding the use of newer commercial building materials and equipment for heating, lighting and plumbing.

They would also supervise building layout and construction and give instructions to unskilled workers, organize exchange of work and materials between farmers, perhaps including such community enterprises as "barn raisings" and a "house raising bee," and cooperate with the county agents in demonstrations of work accomplished.

Certainly any constructive effort leading to unified attack on the general farm building problem is timely. If the present trend is permitted to continue, as seems most probable, before long it will be imperative to take heroic measures or else be content with a perpetual state of inadequate housing for farm products, farm animals, and farm families. No doubt, at the end of the acute defense emergency in which we find ourselves, if not before, a large-scale program for the improvement of farm buildings may be demanded. Whether this happens or not, farm building specialists would do well to devote part of their efforts to studying possibilities for combining their forces in such a way that farmers may actually be able to build the structures essential to stabilized agriculture.